Amateur Television Journal
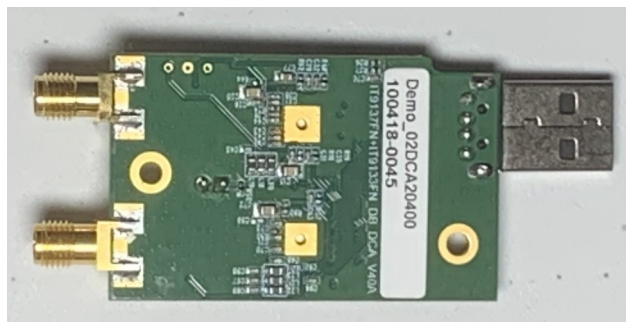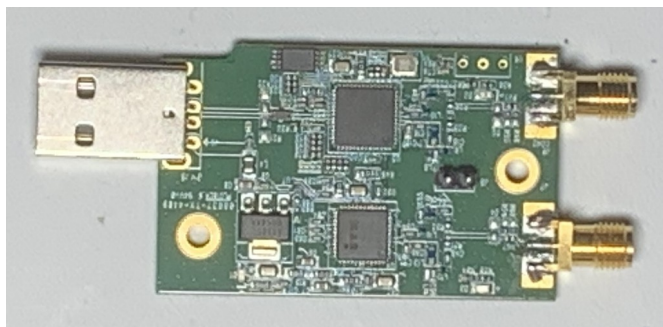
November, 2024
issue #174

BATVC web site: www.kh6htv.com

ATN web site: www.atn-tv.com

Boulder, Colorado -- ATV Repeater

W0BTV

Ch 57   423 MHz   DVB-T

ATN
The Amateur Television Network

**Jim Andrews, KH6HTV, editor -   kh6htv@arrl.net   www.kh6htv.com**

Evaluation of Hi-Des, model UT-120, Dual-Diversity, USB, DVB-T, TV Tuner Dongle

In our previous issue, we reported on the activity of a group of hams in Albuquerque, New Mexico developing a large, high altitude rocket.   They are planning to fly a future rocket with a payload including a 70 cm DVB-T transmitter to broadcast live video during the launch, ascent and descent of the rocket.   They will be using equipment from Hi-Des and KH6HTV Video.   Because of the extremely high speeds attained (3.8 Mach) and high altitude expected (120,000 ft.), tracking this extremely fast moving object with directional 70cm yagi antennas is expected to be a real challenge. To increase their chances of capturing the live down-link video, they plan to use several diversity reception receivers and multiple antennas.   They have purchased several diversity receivers from Hi-Des in Taiwan (https://hides.com.tw/index_eng.html)   They include both model types, the stand-alone

HV-122 and the USB TV tuner dongle model UT-120.   The Albuquerque hams recently sent their UT-120 dongle receivers to KH6HTV for testing and evaluation.   This article reports the findings of those tests.

The UT-120 is a bare-bones, pc board receiver supplied with no enclosure.   See the above photos. It is intended for mobile reception situations with doppler shifts, such as sports, racing, UAVs, etc. It's key specs. are: price = $99, 50-950 MHz frequency range, two SMA antenna inputs, supports DVB-T parameters of 5, 6, 7 or 8 MHz bandwidths,   2K, 4K or 8K FFTs,   QPSK/16QAM/64QAM constellation, 1/2 to 7/8 code rate (FEC), 1/32 to 1/4 guard interval.   It works with 1.1 or 2.0 USB. A Windows PC computer is required for support.   Hi-Des says it is compatible with Windows Media Center.   Hi-Des does supply special PC (including Linux) software.   Their main Windows application program to control and view the video is called "BDA Viewer Plus".

I found the included Hi-Des manuals to be less than useful.   They were obviously dated and not totally accurate for the UT-120.   I encountered a lot of trouble getting the driver to be installed.   After a lot of frustration, I did however finally manage to get the UT-120 operational with my HP Windows 11 laptop PC.   There are features discussed in the manual which I did not find on the UT-120.   Likewise there were feature buttons encountered in the BDA Viewer with no explanation what they did in the manual.
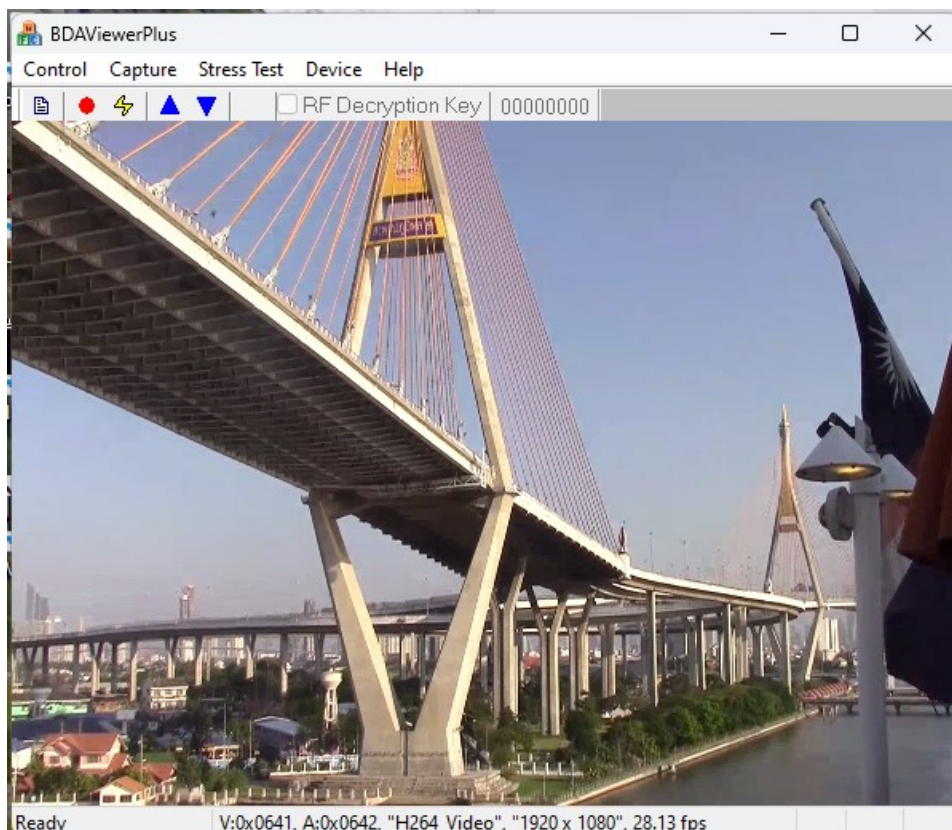
The above photo shows an example of the BDAViewer PC monitor screen actually receiving a "live" DVB-T transmission.   Note the data displayed at the bottom listing the video and audio PIDs, video encoding type, video resolutions and frame rate.   The tool bar on the top gives access to the various control functions.   Clicking on "Device" will tell you if there is an active USB tuner dongle attached.   It should say "IT9135 BDA Filter". "Help" only gives the BDA software version # (in this case 2.4.2.0). "Stress Test" we don't use.   "Capture" is when we want to make a recording of the incoming video.

   The main control is actually labeled "Control".   This is the list of functions available via "Control".
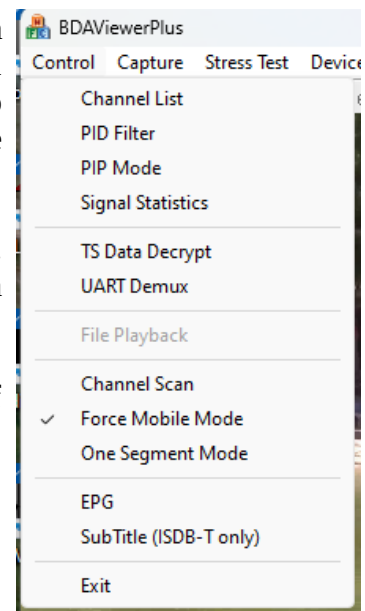
"Control Menu"

The first step is to teach the BDA Viewer program what frequency you want to receive.   It is actually fairly simple and straight forward.   However, like every other digital TV ever made, they are all DUMB until they have been exposed to a true DVB-T RF signal.   Once they "scan" it and recognize it as a valid DVB-T signal, they memorize it and it can then be recalled later. Thus, initially you absolutely must connect a good DVB-T signal directly to the antenna inputs of the dongle. before doing anything else.   Note: I said inputS, in the plural.   There are two independent receivers in the UT-120 with two SMA connectors. You must connect your test rf signal to both of them simultaneously.
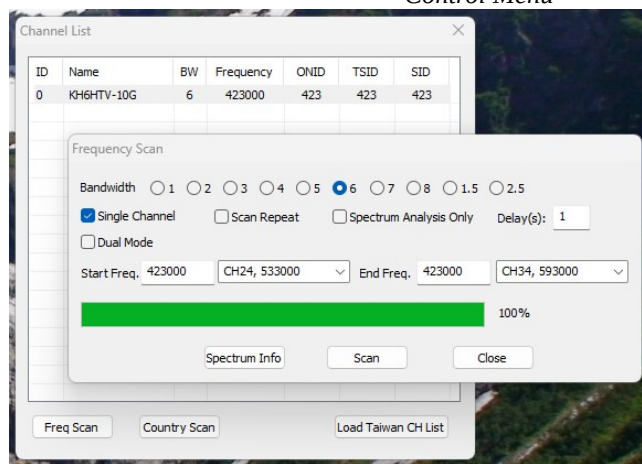
*programming a desired frequency/bandwidth*

Next select either Channel List, then --> push the "Freq Scan" button -- or -- select the "Channel Scan" on the "Control" menu.   Now select the appropriate bandwidth (in our case it was 6 MHz). Select Single Channel.   Enter the start and stop frequencies as the center frequency which you are using.   It must be entered to the nearest kHz.   (in our case we used 423000kHz) Then click on the "Scan" button.   The dongle will briefly scan and find your test signal and should right away start displaying your live video.   Note: I always prefer to play a DVD with lots of motion and sound to be able to verify when I am really getting a signal.   Still test patterns are useless as you can never tell whether you are seeing live video or a freeze-frame.

I have found that with having only a single DVB-T modulator available, that it is impossible to create a memorized channel table of several different frequencies with the UT-120.   Unless it does a scan with

all of the desired frequencies present simultaneously, it will not fill up the Channel List with more than just one frequency.   Bummer !   Fortunately, once you have done this training scan, the BDA program in your PC does remember that one entry channel table. You can turn off the PC.   Disconnect the UT-120.   Actually connect a new, totally different s/n UT-120 into your PC, turn the PC on, run BDA Viewer and it will still tune to the previous memorized frequency / bandwidth.

On the "Control" menu, you will find the button "Signal Statistics" to give you a lot of useful information about the incoming RF signal.

According to the Hi-Des manual, it is supposed to give you information about both receivers, device #0 and device #1.   However, I never was able to get it to turn on both of them.   Never found out which receiver it was actually giving me data for.   Look at this sample display to see all of the multitude of information given.   The RF power S meter reads out in true dBm and is fairly accurate.
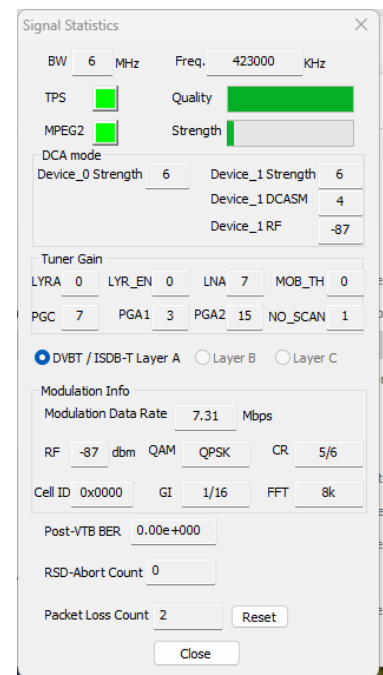
An extremely useful feature, especially for the Albuquerque rocket folks, is the ability to make a permanent DVR (Digital Video Recording) of the signal being received by the UT-120.

Use the "Capture" button on the tool bar to access the record menu. On it you then select the desired frequency/bandwidth, date and time to start the recording, duration of the recording, and designate where to store on your PC the resultant recording.

Note: I found that you absolutely needed to enable on the "control" menu the function "Force Mobile Mode".   If this was not enabled, the receivers seemed to be running at 1/2 frame rate of about 15 Hz. As a result, the .TS recordings were horrible
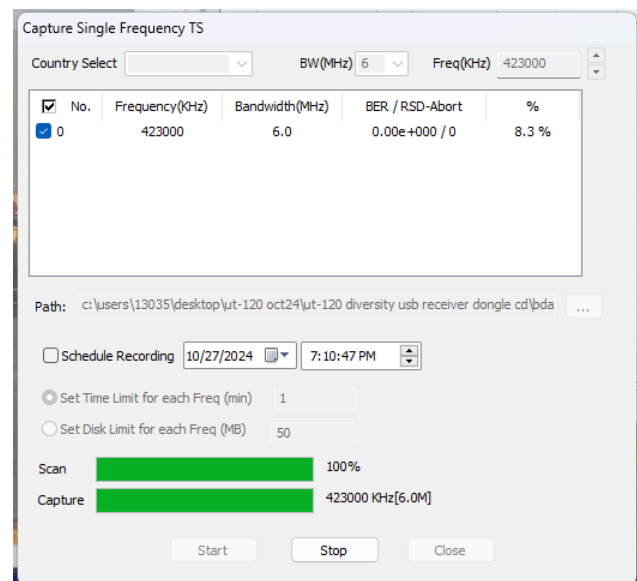
and jerky.   When this was enabled, it seemed to force the system to run at the normal frame rate of 30 fps and then the .TS recordings were normal.

The recordings are done in the .TS format.   By going to the file properties, I did find that the recording retained the hi-definition of 1920x1080, 30 fps of the original signal.

OPERATIONAL TESTS: I setup a lab bench test set to check out the performance of the UT-120s with real DVB-T rf signals.   I used a Media Player to play a pre-recorded vacation video as a source of "live" video complete with lots of motion and sound.   This was the hi-def HDMI source for my HV-320, DVB-T modulator.   I ran the tests on the 70 cm band on 423 MHz with 6 MHz bandwidth.   I then added 30 dB and 20 dB fixed SMA attenuators on the rf output of the HV-320.   I then ran this signal thru 30 ft of coax cable to a 0-69 dB step attenuator and then the UT-120 receiver under test.   This 30 ft of cable was necessary to provide adequate RF leakage isolation to avoid corrupting the later receiver sensitivity measurements.   I used an HP thermistor rf power meter to measure the rf output of the HV-320 modulator.   I measured the insertion losses of the coax cables used.   Thus, I was able to know accurately the actual rf power I applied to the dongles under test.

Diversity Test: For the first test, I wanted to see if the UT-120 really did work as a diversity receiver.   At the input to the UT-120, I added a 3dB SMA power divider and two short SMA coax cables attached to the two SMA antenna inputs on the UT-120 dongle.   This then put the same, identical rf signal into each receiver.   I would then disconnect one or the other of the two short antenna cables, thus removing a signal from first one then the other receiver.   All the while I was monitoring the PC's displayed video images.   I was unable to detect when the UT-120 switched from one receiver to the other.   The displayed video seemed to be continuous with no interruptions. Exactly what it was supposed to do.

DVR Test: I also tested DVR recording on the PC while forcing the receiver to switch from one antenna to the other by alternately connecting and disconnecting cables.   I also tested with complete loss of signal to both antenna ports.   The recording process continued uninterrupted which is a desirable feature.   I have encountered on most stand-alone DVB-T set-top boxes which included the DVR feature, that the recording process stopped and did not restart once a signal was lost which was an undesirable feature.

Sensitivity Test: For this test, I removed the 3dB power splitter used above.   I connected the rf test signal to only one antenna input at a time.   I then switched in a lot of rf attenuation with the rotary step attenuator.   I then brought up the rf signal level in 1 dB steps until suddenly video and audio appeared on the PC monitor.   I also tested going the other direction from strong to weak signals. I considered the digital threshold to be the weakest signal at which I got perfect P5 video and Q5 audio. The digital cliff was very sharp. There was typically only 1-2 dB difference between perfect P5 and P0 nothing.   I then ran tests of all the four dongles from New Mexico.   I found one dongle to be defective with only one of the two receiver ports functional.   The others all worked normally. However, there was a bit of variation in sensitivity noted between various units.   Typically no more than 1 to 2dB.

For "Normal Ham DVB-T Parameters" --- I found the UT-120 sensitivity to be **-94 dBm.**
                          Adding   a low noise, pre-amp gave 3 dB improvement to **-97 dBm**.

These values are essentially the same as I have measured on most other DVB-T receivers, both from Hi-Des and consumer grade, set-top boxes.   With changes in these parameters, the sensitivity will vary up or down from these values.

[*"Normal Ham DVB-T Parameters" are: 70cm (435 MHz), 6 MHz band-width, QPSK constellation, 8K FFT, 5/6 Code Rate, 1/16 Guard Interval, H.264 video encoding, 1920x1080 resolution, 5.5 Mbps, 30 GOP   -- Audio encoding of MPEG2, 96kbps*]

73 & Aloha de Jim Andrews, KH6HTV, Boulder, Colorado

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ATN - California News:

Nice news journal Jim!   Some news from ATN:

1.   The Mt. Wilson repeater has changed our output from VSB analog to DVB-T digital, our output is 1267 MHz at 6 MHz bandwidth.

2.   We have the equipment to change Santiago Peak from VSB to DVB-T with output at 1255 MHz at 6 MHz.

3.   ATN has changed our Oat Mountain repeater output from 919.25 MHz VSB to 1241.25 MHz VSB. In the future we may go DVB-T as well.

4.   We are encouraging our members to continue the transition off of AM 434 MHz. Some repeaters no longer have stations using analog 434 MHz to access the repeater, two others only have one station each and Oat Mountain has three analog 434 MHz stations.

73, Mike WA6SVT

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SAR Drone+Flight Management Control

KD6ILO portable DVB-T/S station

SAN DIEGO ATV NEWS: Mario, KD6ILO, reports --- "Greetings -- Just sharing what we achieved with our inventory this afternoon (10/27).   We try to bring out what we have developed for community support for SAR and TV image coordination with our first responders. Today was our aviation support along with Part 107 FAA training.

UAV to DVB-T2 Mobile Ground Terminal

SD DVB via SAT Terminal Deployed

Sharing the weekend activities with exercising our inventory for training new and concurrent members. Our VIASAT terminal and our third UAV X-Band Ground Mobile station [5.8Ghz_DVB-T2>S2 Network]. We will be testing a new FSO-720nm transmitter for the UAV platform {in lab testing now}.

Sharing some updates, I've got a NEMS server running [on Rasp-pi3B+] monitoring my AREDN, IRN MESH, and RF-FSO Gateways. The A.I. in the Tactical Overview keeps me aware of the health and operational status of the networks [I will integrate {NEMS} into the next version of RF-FSO RigNet Gateways.] It took me some long, quiet evenings to focus on each host and their settings for each but it was well worth the time spent.This makes scheduled time maintenance for the network manageable. I also have the TV Dashboard on NEMS transmitted on one of our ATSC channels [Ch.15-1(441.25)]. We {I} can say we have a truly NexGen Amatuer Communications RF-FSOC Integrated Network. Forgot to mention it does email, text and you have access via your mobile smart devices.
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News from Idaho: Mike, KM7MH, reports that he has been working on a design for a circuit to achieve a PTT output from a GT Media V7 Pro, DVB-T, set-top box receiver.   The receiver provides both HDMI and also analog composite video (plus stereo audio) A/V outputs.   Mike's design senses active video regardless of the presence of sync and provides TTL level output. Power and video input are derived from the rear panel of the V7.   +5V power comes from the USB port.   His circuit uses the analog composite video signal output for analysis and detection. His first pass with a working prototype works, but not reliably.   Under some video conditions, it gives a false output.   He is continuing to work on the issue.   He says that he as found an old app. note from Renesas semiconductor on the subject using an EL4501 sync separator. He hopes to next give that a try.
 Has anyone else been able to come up with a working circuit to accomplish what Mike is trying to do ?
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News from Deutschland

I am trying to open ATV repeaters with a portable setup, see the picture with the tower (Longinusturm) and the picture with my car. During these experiments, I realized that my equipment is very impractical. So I am now building the devices on two platforms and have bought new antennas that can be mounted on photo tripods. I can use the parabolic antenna for QO-100 as well as for ATV and for receiving beacons. For transmit-receive operation, I have to remove the preamplifier. The direction of polarization can be easily changed with the ball heads.

Best regards from Germany, Wilhelm, DG2YK

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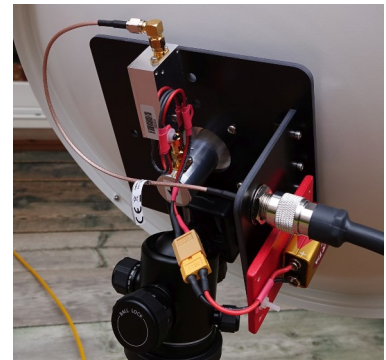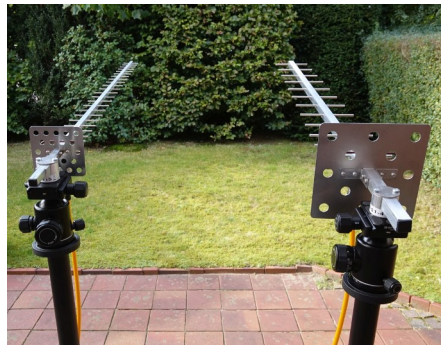
W0BTV Details:

Inputs: 23 cm Primary (CCARC co-ordinated) + 70 cm & 3 cm secondary   all digital using European Broadcast TV standard, DVB-T with standard 6 MHz wide TV channels. Frequencies listed are the center frequency of the TV channel.
23 cm = 1243 MHz (primary), 70 cm = 441 MHz & 3 cm = 10.380 GHz
Outputs: 70 cm Primary (CCARC co-ordinated), Channel 57 -- 423 MHz with 6 MHz BW, DVB-T
Also, secondary analog, NTSC, FM-TV output on 5.905 GHz (24/7 microwave beacon).
Operational details in AN-51d   Technical details in AN-53d.   Available at:
https://kh6htv.com/application-notes/

W0BTV ATV Net:
We hold a social ATV net on Thursday afternoon at 3 pm local Mountain time (22:00 UTC). The net typically runs for 1 to 1 1/2 hours.   ATV nets are streamed live using the British Amateur TV Club's server, via: *https://batc.org.uk/live/* Select *ab0my or n0ye*.   We use the Boulder ARES (BCARES) 2 meter FM voice repeater for intercom.   146.760 MHz (*-600 kHz, 100 Hz PL tone required to access*).

Newsletter Details:
This newsletter was started in 2018 and originally published under the title "*Boulder Amateur Television Club - TV Repeater's REPEATER*"   Starting with issue #166, July, 2024, we have changed the title to "*Amateur Television Journal.*"   This reflects the fact that it has grown from being simply a local club's newsletter to become the "de-facto" ATV newsletter for the USA and overseas hams. This is a free ATV newsletter distributed electronically via e-mail to ATV hams. The distribution list has now grown to over 800+, both in the USA and overseas.   News and articles from other ATV groups are welcomed.   Permission is granted to re-distribute it and also to re-print articles, as long as you acknowledge the source.   All past issues are archived at: https://kh6htv.com/newsletter/